FM 600

Field Microscope

Maintenance Manual

Columbia Instruments

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Columbia Instruments Inc.
Trussville, AL 35173

FM 600
Maintenance Manual

We will cover problems that might occur with the FM 600 Microscope starting from the top and working down.

Poor Resolution

If you feel your image is not good, check the optics to ensure they are clean. If the top of the eyepieces are not clean, this could result in poor resolution. Moisten the lens either by breathing on them or applying a small amount of lens cleaner and gently wipe in a circular motion. Check the condition of the front lens of the objectives. On the 40x and 100x objectives, it may be necessary to check them by using an eyepiece as a magnifying lens. Remove an eyepiece using the .050" hex wrench supplied with the microscope to back off on the 3-48 socket set screw. Look through the bottom side of the eyepiece with it positioned approximately 15 to 20 millimeters from the front of the objective. Clean, if necessary, by moistening the front lens and gently rub in a circular motion. If dirt or foreign matter still remains, it may be necessary to use a small amount of xylene or acetone. Be sure to apply these chemicals in small amounts and remove any excess immediately.

Double Vision

If the image is different in each eyepiece, either the head is out of alignment or the optical elements in one of the eyepieces is upside down. If you have a spare set of eyepieces, you can swap them to see if the eyepieces are the problem. To check the prisms, remove the head and hold it up to the light and look through the underside. If you see a single round image, the prisms are not at fault.

Slide Will Not Come Into Focus

If the slide will not come into focus, check the screw at the rear of the stage plate under the arm. This screw prevents the stage from touching the slide and breaking it. Before resetting this stop screw, make sure the

fine adjustment travel is at mid point and then back off on the stop screw until the slide comes into focus .

Stage Drifting Out of Focus

If you find the slide slowly drifts out of focus after you have just focused it, it will be necessary to tighten the course adjustment. Using the spanner/ screwdriver supplied with the microscope, insert the tip of the spanner into a hole on the pinion sleeve inside the right course adjustment knob. Pull down until the drifting has stopped.

Using the Mirror for Illumination

If the illuminator should fail to operate and the mirror and fork needs to be installed, it will be necessary to remove the illuminator housing and insert the mirror and fork in the hole directly in the center of the lower illuminator plate. To remove the housing, note there are two screws on the underside of the base. Remove the screws and the housing can then be removed to insert the mirror and fork.

Maintaining the Iris Diaphragm

Over a period of time the leaves of the iris diaphragm become dry or get a build up of foreign matter. This causes friction between the leaves and they can pucker and then bend and jump from their inserts. You cannot reinsert bent leaves and it will be necessary to replace the iris diaphragm. To prevent this problem, it is advisable at the first sign of the leaves dragging to spray a small amount of WD-40 through the lever slot and work the lever back and forth until the oil loosens the leaves.

Replacing the Course and Fine Adjustment Lubricant

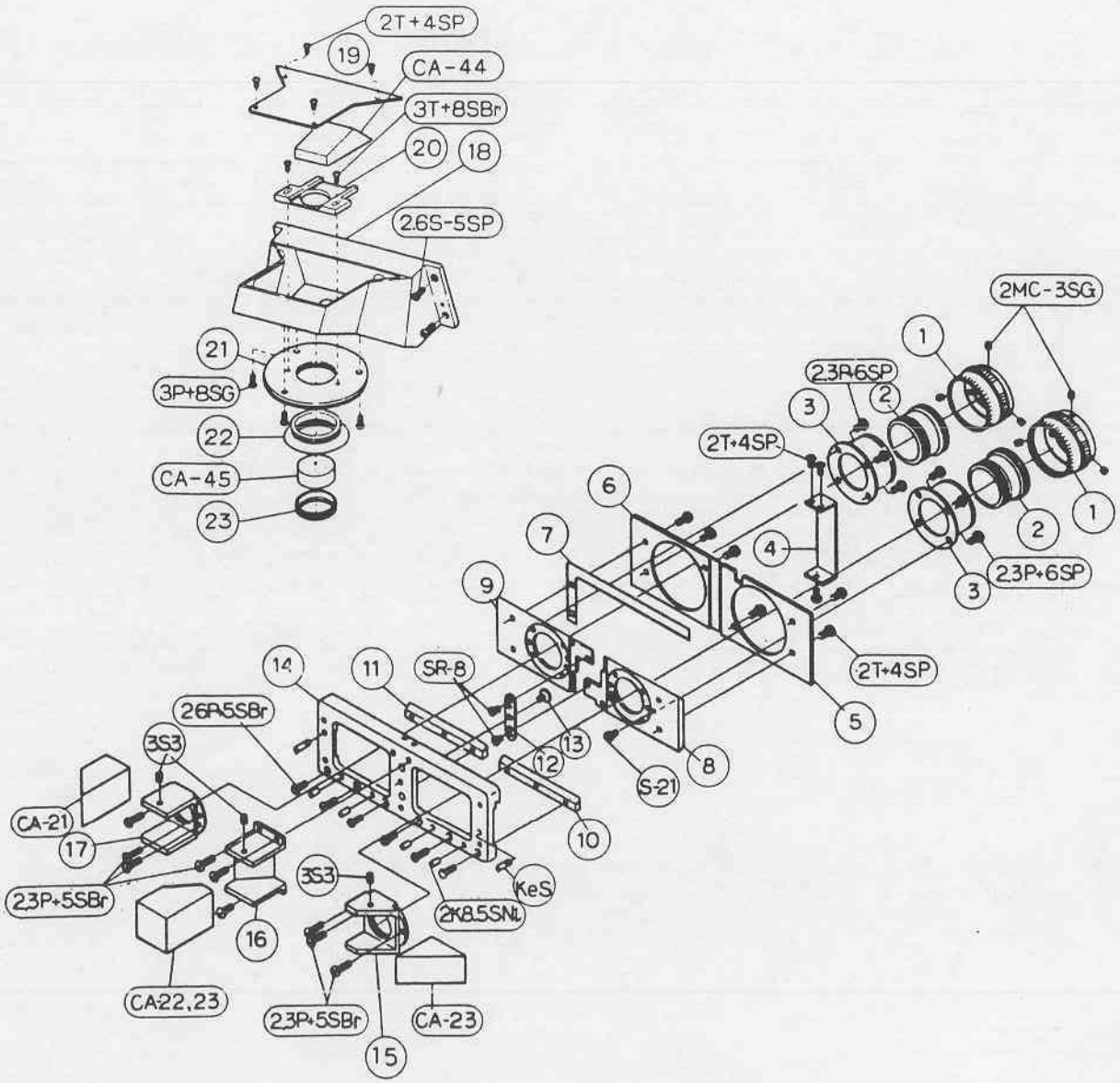
At some point, it will be necessary to replace the course adjustment lubricant. It is recommended every two years, however, it depends on how often the microscope is used and the conditions of the workplace.

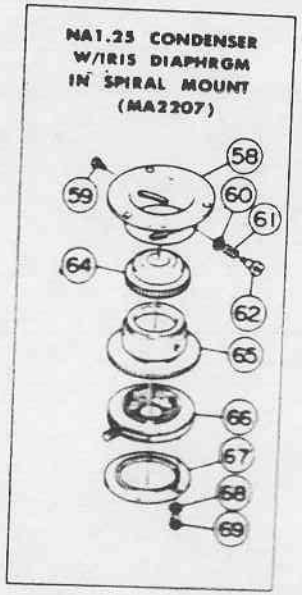
Remove the three screws holding the base plate (C-1). Rack the course adjustment block and stage assembly off the arm of the microscope. Moisten a rag with mineral spirits or a solution that will remove grease and clean the slideways of the coarrse adjustment block. While this piece is at hand, check the rack screws to make sure they are tightened properly. Using a 3MM allen wrench, remove the two socket screws (56) holding the stage to the course adjustment block.

Remove the two small screws (B-18) holding the metal plate (B-19) on top of the course adjustment block and place one finger on top of the plate since there is a spring under this plate to place tension on the fine adjustment assembly. After setting the plate, screws and spring aside, separate the stage support from the course adjustment block and remove the lubricant from the slideways of both of these pieces.

Apply a small amount of medium lubricant to the slideways and make sure the point of the fine adjustment lever (B-7) aligns with the fine adjustment guide (B-4) before replacing the metal plate on top of the course adjustment block. Now remove one of the course adjustment knobs by inserting two needle nose pliers into the nut (27) on the inside of each coarse adjustment knob and turn in opposite directions. Pull the pinion (24) from the pinion metal (22) and remove the old lubricant. Apply a small amount of new lubricant and reassemble. Check the two screws (21) that hold the pinion metal in place. Reassemble pinion and pinion metal and the nut holding the course knob. Assemble the coarse block to the arm and the base to the arm. Check the tension on the coarse adjustment.

FW 500 Field Microscope
Microscope Parts List




NA1.25 CONDENSER
W/IRIS DIAPHRGM
IN SPIRAL MOUNT
(MA2207)
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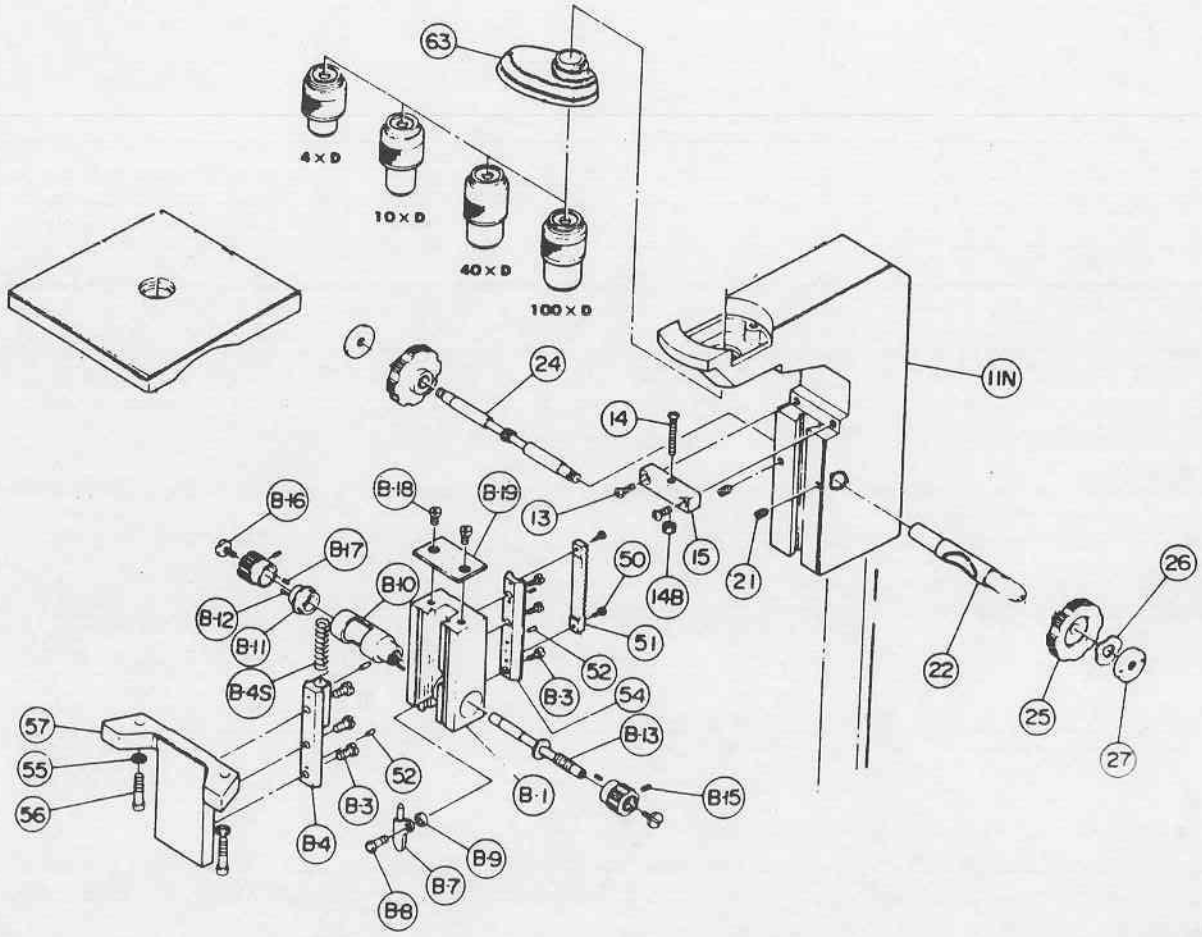
63
4×D
10×D
40×D
100×D
24
11N
14
B-16
B-18
B-19
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B-17
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148
26
B-10
B-12
B-11
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22
B-4S
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B-3
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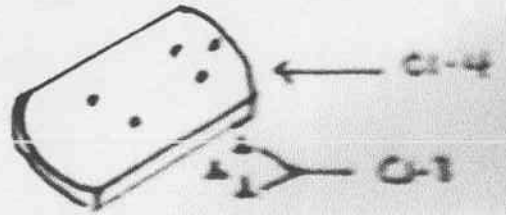
C1-4
C1-5
C1-1

FM 600

Field Microscope

Instruction Manual

Columbia Instruments Inc.
Trussville AL 35173

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Columbia Instruments Inc.
P O Box 424
Trussville AL 35173

Model FM 600
Field Microscope Specifications

Binocular head with dual diopter tubes and interpupillary adjustment. Removal by means of knurled knob for storage.

Paired 10X DIN Widefield eyepieces.
4X DIN N.A. 0.10 Objective.
10X DIN N.A. 0.25 Objective.
40X DIN N.A. 0.65 Objective, retractable.
100X DIN N.A. 1.25 Oil immersion objective, retractable.

Abbe condenser N.A. 1.25 with iris diaphragm in spiral mount.

Mechanical stage, attachable, with low position coaxial control knobs.

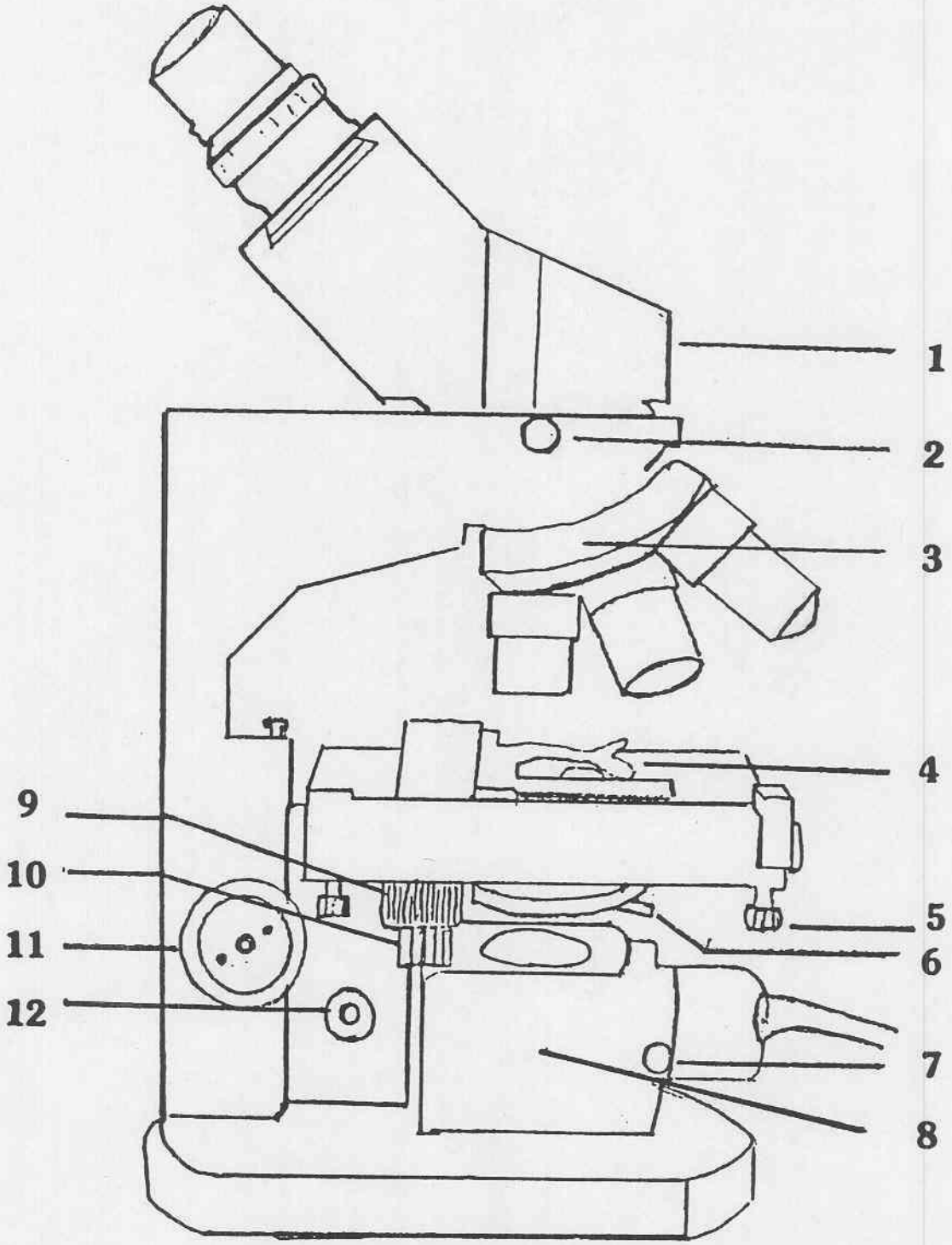
Dual coarse and fine adjustment control knobs.

Illuminator, attached, 6 volt, 5 watt krypton with condensing lens and blue filter.

Above works off the following:

100-230VAC, 50-60Hz
8-32 VDC External battery.
24 Volt tactical vehicle battery.
Mirror and fork.

Charge time for power supply internal battery is two hours.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Preliminary Set Up

After removing the microscope stand from the carrying case, loosen the thumb screw (2) on the arm of the microscope and tilt the head (1) to insert into the top of the arm. Tighten the thumbs screws to secure the head. The mechanical stage is secured to the front portion of the stage plate for proper fit in the storage case. Loosen both thumb screws (5) that secure the mechanical stage to the stage plate and position the mechanical stage on the right side of the stage plate so the rear thumb screw is approximately 1/4 " from the rear of the stage plate. Once in this position, the specimen slide can be completely examined. ***IMPORTANT!*** Tighten the thumb screws only snugly. If the thumb screws are tighten too much, north and south movement of the mechanical stage will be adversely affected. Make sure that all of the objectives are screwed into the nosepiece firmly and have not worked loose since the microscope was last used.

Procedure for Adjusting the Binocular Head

(1) Adjust interpupillary distance for comfortable viewing by pulling on the sliders at the base of the diopter tubes until you see one field of view.

(2) Both diopter tubes have numerical settings which should be set at 63.

(3) Focus sharply on a specimen slide with one eye closed. Now close that eye and focus with the other eye using only the diopter tube as the focusing mechanism. The microscope will now be adjusted to your particular vision requirements and parfocal at all powers.

Viewing the Specimen Slide

Lower the stage with the coarse adjustment knobs (11). Move the lever on the iris diaphragm until the iris diaphragm is almost completely open. Rotate the nosepiece (3) until the 4X objective is in place. Open the spring finger (4) on the mechanical stage and place the specimen slide securely into place. Move the stage

up with the coarse adjustment knob until it touches the stop mechanism. Move the specimen slide with the mechanical stage controls until it is directly over the center of the condenser. The larger knob (9) of the mechanical stage moves the slide in a north and south direction, while the lower small knob (10) moves the specimen in an east and west direction. Slowly lower the stage using the coarse adjustment knobs until the slide comes into focus and use the fine adjustment knobs (12) to bring it into fine focus. Position the specimen slide as desired using the mechanical stage. Adjust the iris diaphragm to improve specimen image contrast. The Abbe condenser is mounted in a spiral mount and can be raised or lowered until the field is evenly illuminated.

Use of the 100X Oil Immersion Objective

For specimens requiring the 100X oil immersion objective, position the Abbe condenser in the upper most position and partially rotate the nosepiece so the objectives are between

positions (as out of the way as possible without lowering the stage). Place drop of oil on the specimen slide and rotate the nosepiece so the 100X objective clicks into position, making contact with the oil. Raise the stage slightly using the fine adjustment only until the specimen is in focus. Use the iris diaphragm to improve the image quality. If the image is not good and the objective is clean, an air bubble or dirt may be in the oil and it will be necessary to remove the oil from the slide and the front lens of the 100X objective and start over again.

Changing the Illuminator Bulb

Unplug the illuminator and turn the knurled ring (7) counter clockwise and remove the illuminator socket. Grasp the bulb while pushing down and turn counter clockwise and remove. Insert new bulb by pressing down and turning clockwise and insert socket into illuminator housing and turn knurled ring to secure.

Maintenance Suggestions

All lens surfaces should be kept clean. Smudges, fingerprints or soil of any kind can greatly reduce the resolution. The upper eyepiece lens, in particular, can be easily soiled. Moisten the lens either by breathing on it or applying a small amount of lens cleaner and gently rub with lens paper. ***Never wipe any lens surface that is dry!*** Dust particles can act as an abrasive and can scratch the lens coating. The front lens of the objectives may require periodic cleaning. To clean, moisten part of a sheet of lens paper and gently rub in a circular motion and remove any excess lens cleaner with the other half of the lens paper. The 100X oil immersion objective should be carefully cleaned after each use to ensure all oil has been removed. The top lens of the condenser and mirror should be kept clean. Use the same method for these as for the objectives and eyepieces.

Power Supply Instructions

The microscope illuminator is fitted with a cable and plug which connects to the 'DC OUTPUT' jack on the power supply. This jack will supply 6 volt DC power at up to 1 amp for other purposes (such as a small centrifuge) if desired.

The power supply is designed to supply the illuminator lamp from a variety of external sources or from its internal rechargeable battery. External sources include any DC supply from 8 volts to 32 volts, connected via the supplied alligator clip cable (red connects to the positive side of the external source). AC power (100 through 230 volts AC, 50-60 hertz) can be used when available by plugging in the attached power power cord (an adapter would be necessary for some 220 volt outlets). No switches or adjustments are necessary to change voltages; the power supply automatically recognizes and compensates for any voltages within specified ratings. However, only one source should be connected at a time. The external power sources will recharge the internal battery; approximately 4 hours is required to completely recharge the internal battery.

DC SUPPLY:

Using the supplied alligator clip connecting cord, connect to the DC supply (red clip connects to the positive side of the external source) and plug into the 'DC INPUT' jack on the power supply. Conventional 12 volt automotive battery, 24 volt tactical vehicle battery, dry cell battery pack, or any other DC power within voltage limits and capable of at least 1 amp can be used.

AC SUPPLY

Simply plug the power cord attached to the supply into an AC outlet supplying 100-240 volts, 50-60 hertz. A suitable adapter could be necessary to connect to certain 220 volt outlets, but no switching or adjustment is required.

INTERNAL BATTERY

A 6-volt rechargeable battery is included in the power supply housing. When fully charged, this battery will power the microscope illuminator for approximately two hours. Re-charging from an AC power source will require up to four hours, depending upon the state of the battery. An automatic regulator prevents overcharging.

POWER SUPPLY SPECIFICATIONS

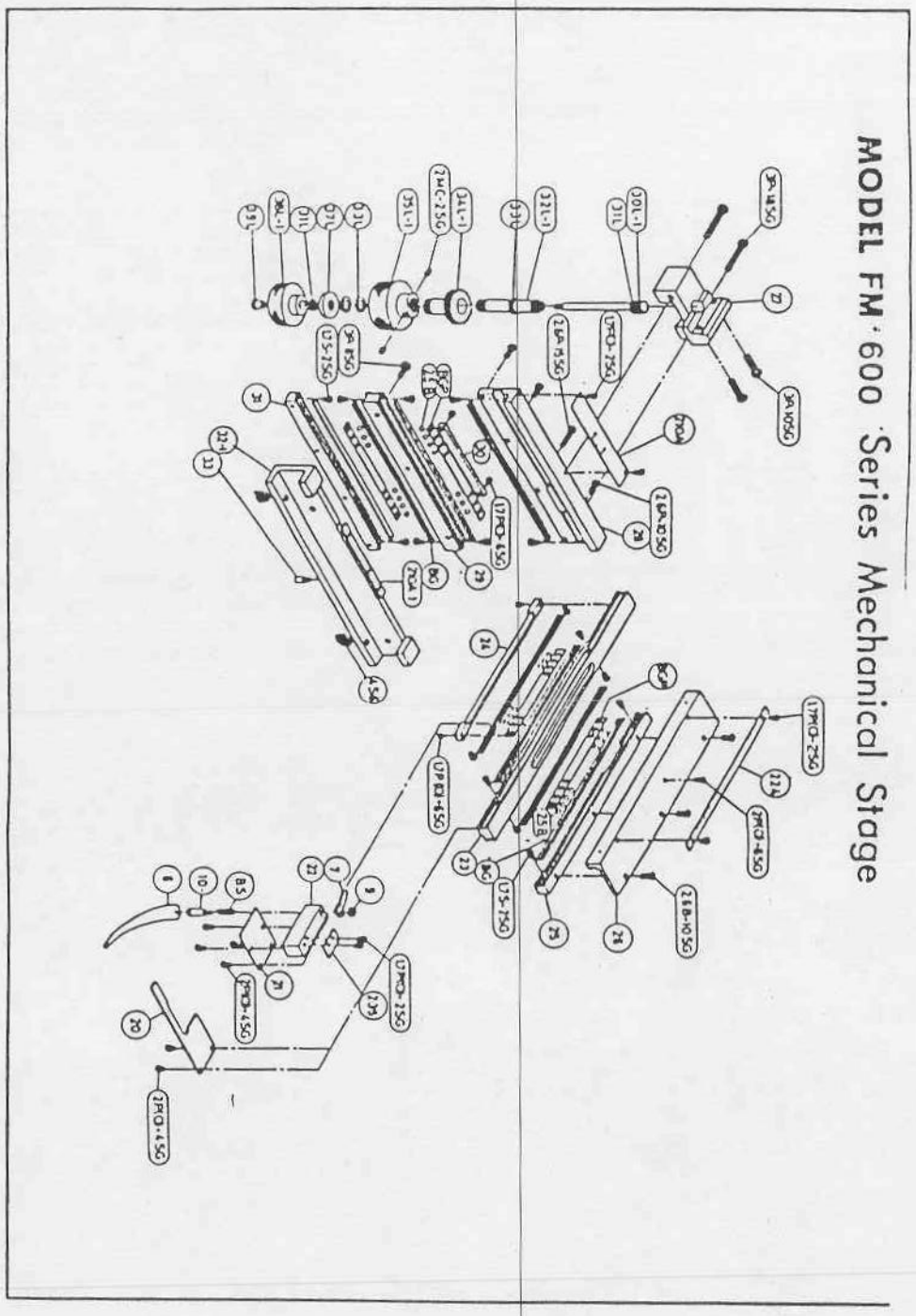
Self contained, automatic switching power supply
Fully protected against overload (including short circuit)
Foldback, with quick automatic reset
Low noise, extremely efficient true switching operation
Tapered battery charging circuit for internal battery

INPUT: AC - from 100 volts to 230 volts, 50-60 hertz
DC - from 8 volts to 32 volts from any available source (DC and AC sources should ***NOT*** be connected simultaneously)

OUTPUT : 6 volt DC, up to 1 amp

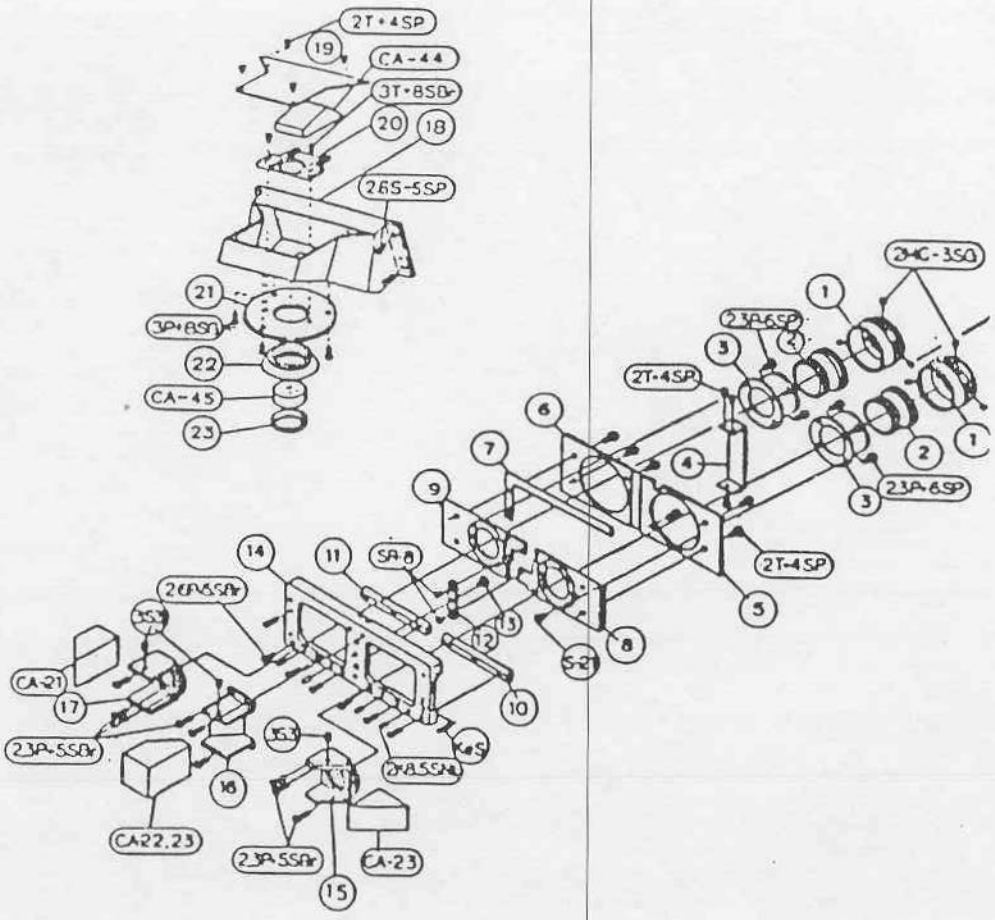
INTERNAL BATTERY: Rechargeable, 6 volt output. Supplies the illuminator lamp for 2 hours.

BG	Ball guide	27.15
2.5B	Steel Ball	.47
BGP	Ball guide plate	6.15
1.7S-2SG	Screw	.23
224	Graduated plate	1.37
2P(0)+6SG	Screw	.47
1.7P(0)+2SG	Screw	.47
2.6B+10SG	Screw	.47
26	Holder	6.35
25	Slide holder	8.13
1.7S-2SG	Screw	.40
23	Slider	7.30
1.7P(0)+6SG	Screw	.47
24	Rack	12.00
7	Lever	3.75
9	Nut	1.35
1.7P(0)+2SG	Screw	.40
235	Vernier plate	2.10
22	Vernier seat	2.17
21	Plate	.35
2P(0)+4SG	Screw	.47
20	Clip	3.35
2P(0)+4SG	Screw	.47
BS	Spring	.35
10	Shaft	6.25
6	Finger	4.13
3P+10SG	Screw	.47
1.7P(0)=2SG	Screw	.47
210A	Vernier	2.11
2.5P+15SG	Screw	.47
2.6P+10SG	Screw	.47
28	Holder	9.15
BGP	Ball guide plate	3.10
2.5B	Steel ball	.60
BG	Ball guide	1.75
29	Slider	8.26
3P+8SG	Screw	.47
1.7P(0)+6SG	Screw	.47
30	Rack	12.00
3P+8SG	Screw	.47
1.7S-2SG		.35
31	Slider holder	8.13
32-1	Holder	9.15
210A-1	Graduated plate	.45
33	Screw	.47
4S6	Screw	.47
27	Pinion block	6.13
3P+18SG	Screw	.47
30L-1	Pinion	12.15
31L	Washer	.10
32L-1	Pinion metal	9.61
33L	Washer	.10
34L-1	Pinion	8.45
2MC-2SG	Screw	.40

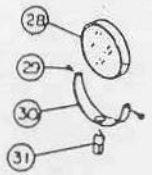


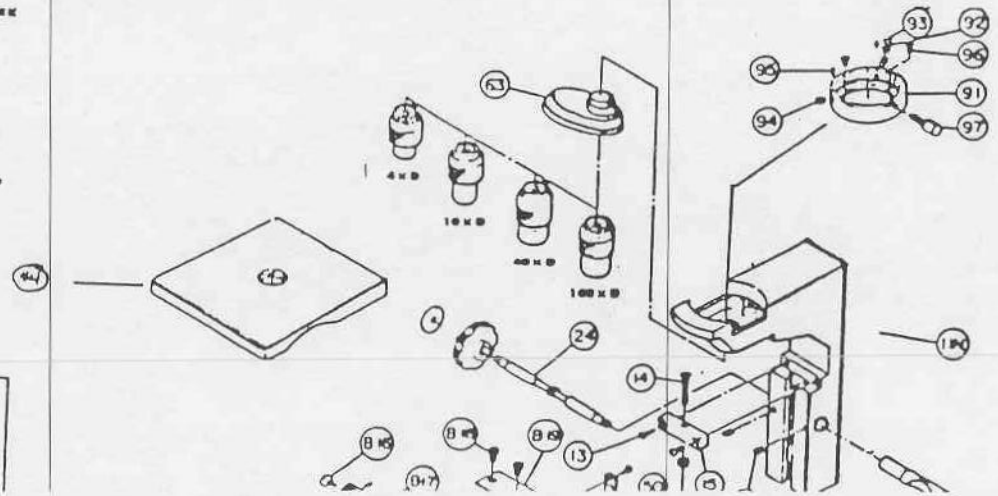
35L-1	Knob	3.75
33L	Washer	.10
37L	Nut	.27
31L	Washer	.10
38L-1	Knob	3.96

11N	Arm and cover plate	77.00
13	Screw	.12
14	Screw	.12
15	Rack Stop Block	2.75
21	Screw	.18
22	Pinion metal	38.00
24	Pinion	22.00
25	Coarse adj. handle	14.50
27	Nut	2.35
44	Stage	44.00
50	Screw	.22
51	Rack	28.15
52	Knock pin	6.25
54	Rack guide	8.35
56	Screw	.18
57	Stage holder	27.15
63	Revolving nosepiece	47.00
B-1	Fine adj. block	33.15
B-3	Screw	.18
B-4S	Fine adj. spring	1.60
B-4	Fine adj. guide	2.90
B-7	Fine adj. lever	3.15
B-8	Screw	.18
B-11	Pinion bushing	4.55
B-12	Screw	.18
B-13	Pinion	35.75
B-10	Pinion metal	27.15
B-15	Set screw	.18
B-16	Set screw	.18
B-17	Screw	.18
B-18	Screw	.18
B-19	Cover	3.00
91	Adapter	12.75
92	Plate	2.15
93	Screw	.18
94	Screw	.18
95	Screw	.18
96	Screw	.18
97	Screw	.18
28	Mirror	16.00
29	Screw	.24
30	Mirror bow	6.00
31	Mirror stud	3.25
2MC-3SG	Screw	.26
1	Graduated tube	13.45
2	Innertube	16.15
2.3P+6SP	Screw	.18
9	Sliding plate	18.35
11	Guide	8.13
14	Seat Plate	5.65
KeS	Screw	.18
2.6P+5SBr	Screw	.18
2T+4SP	Screw	.18
5	Cover plate	2.75
6	Sliding plate	7.35
S-21	Screw	.24
10	Guide	3.75
2K8.5SNi	Knock pin	2.35
3S3	Screw	.18
16	Prism case	11.75
2.3P+5SBr	Screw	.18
CA-22.23	Prism	42.00
CA-21	Prism	37.75
CI-1	Screw	.36
17	Prism case	47.75
2.3P+5SBr	Screw	.18
19	Plate	6.13
20	Prism seat	5.15
18	Binocular body	63.00
21	Prism seat	15.15
22	Prism holder	12.35
CA-45	Prism	42.00
23	Ring	1.65
2.6S-5SP	Screw	.24
CA-44	Prism	27.00
3T+8SBr	Screw	.36
3P+8SG	Screw	.27
CI-2	Receiver	9.16
CI-3	Screw	.24
CI-4	Base	46.00



MIRROR AND FORK

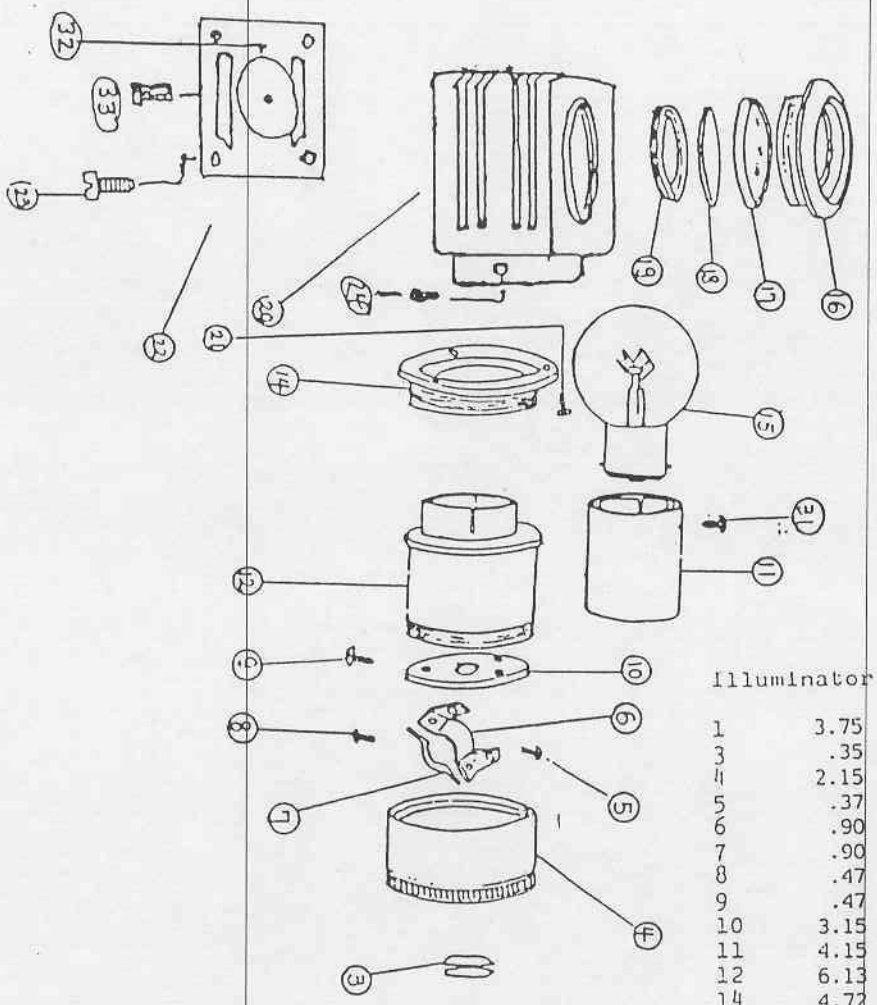




MAT.28 CONDENSER W/RUBB DIAPHRAGM INF SPHERAL MOUNT (MA2307)

FM-600 Illuminator Parts and Price List

FM 600 SERIES MICRO-ILLUI



Illuminator		
1	3.75	Cord w/plug
3	.35	Rubber grommet
4	2.15	Cap
5	.37	Screw
6	.90	Cord holder, upper
7	.90	Cord holder, lower
8	.47	Screw
9	.47	Screw to fix earth wi
10	3.15	Cord retainer
11	4.15	Socket
12	6.13	Socket housing
14	4.72	Adapter
15	12.00	Bulb
16	4.00	Condenser lens frame
17	14.00	Condenser lens
18	12.00	Blue filter
19	2.10	Retaining ring

Wiring Diagram
for
FM 600 Power Supply